

FOOD SPECTRUM OF THE MARBLED TOAD, *BUFO STOMATICUS* LUTKEN¹

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The paper presents a detailed food spectrum of *Bufo stomaticus*, the commonest species of toad in Punjab. The observations made on the gut contents of this animal from May to October 1985 revealed the presence of insects (70 families), spiders, centipedes, molluscs, plant materials, debris, mud and stone pieces. It is concluded that the toad is primarily insectivorous.

INTRODUCTION

Bufo stomaticus though a common species of Anura in Punjab has not yet been investigated for its food and feeding habits. In the present paper the quality and quantity of the food of this toad, based upon gut content analysis, is presented.

MATERIAL AND METHODS

The stomach content analysis of *Bufo stomaticus* was carried out during May to October, 1985. The toads were collected during dusk and before dawn when they leave their hideouts. The toads were killed instantly after collection by putting 20 ml of chloroform in the plastic bucket with lid containing the animals, and 6 ml of 5% formalin solution was injected in the stomach of each so as to preserve the organ and to stop the mixing of gastric juice with the food. In the laboratory the stomach of each specimen was removed and stored in 70% ethanol. For the investigations, stomach contents were taken out in a petridish in alcohol after incising the stomach longitudinally. The contents were examined under a binocular dissecting microscope (18, 8x). The contents were separated into two groups (i) whole or almost whole insects, insect fragments namely, head capsules, dissociated legs, sclerites, wings, elytra, ovipositors etc. (ii) other items namely, fragments of spiders, centipedes, earthworms, mollusca, pebbles and plant matter. Using diagnostic taxonomic characters the food contents of the first category were identified.

RESULTS

The monthly distribution of the food items recorded from the guts of *Bufo stomaticus*

during May to October 1985 is shown in Table 1. It is seen that the toads primary food is insects but other animals like spiders, centipedes, earthworms and molluscs are also eaten. Some percentage of the food is comprised of plant matter and even pebbles. The consumption of insects per toad (Table 1) is high in the months May to July (26-28) but declines in August (16). The toad fed on a variety of insects belonging to 70 families of 14 orders. The most predominant insect orders were Coleoptera and Heteroptera which constitute the main food in terms of varieties of insects captured by *Bufo stomaticus*. The data (Table 1) further indicates that except Hymenoptera, other predominant orders were phytophagous insect pests, i.e. Coleoptera, Heteroptera, Lepidoptera, Homoptera and Orthoptera constituting 28, 10, 5, 5 and 4 families respectively.

The toad fed mainly on Hymenoptera (ants, Myrmicinae and Formicinae), Diptera (mosquitoes) and Coleoptera (beetles) during the month of May. Phytophagous pests viz. Anthicoridae (flower bugs), Lygaeidae (dusky cotton bug), Elateridae (click beetles), Chrysomelidae (red pumpkin beetles) and Noctuidae (army worms and *Heliothis* larvae) were also recovered from the stomachs of *Bufo stomaticus* during May, 1985.

During June-July 1985 (Table 1) the most predominant food items of this animal were Isoptera (termites) and Hymenoptera (ants, Myrmicinae and Formicinae). Amongst the phytophagous pests, Pyrrhocoridae (red cotton bug), Cicadellidae (leaf hoppers particularly cotton jassids and mango hoppers), Fulgoridae (plant hoppers mainly *Pyrilla*), Psyllidae (jumping plant lice mainly *Citrus psylla*), Carabidae (ground beetles), Dermestidae (carpet beetles), Elateridae (click beetles), Psephenidae (water-penny beetles), Tenebrionidae

¹Accepted August 1987.

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(darkling beetles), Scarabaeidae (scarab beetles), Chrysomelidae (mainly red pumpkin beetles), Curculionidae (snout beetles), Noctuidae (army worm and heliothis larvae) and Pyraustidae (cotton leaf roller) were also fed on by *Bufo stomaticus*, indicating that this toad may be useful for control of phytophagous pests. However, during this period (June- July 1985) they also fed on parasites and predators, namely braconids, trichogrammatids, sphecids, chalcids and ichneumonids in tangible amounts.

Hymenoptera (ants, Myrmicinae and For-

micinae) were again the major food items of *Bufo stomaticus* during August-September 1985 (Table 1). In addition, Cicadellidae (leaf hoppers mainly cotton jassids and mango hoppers), Fulgoridae (plant hopper namely the *Pyrilla*), Dytiscidae (predaceous diving beetles), Telegeusidae (telegeusid beetles), Pselaphidae (short-winged mould beetles), Dermestidae (carpet beetles), Chrysomelidae (mainly red pumpkin beetles), Pieridae (cabbage caterpillar) and Diptera (mosquitoes) were present in large numbers.

TABLE I

PERCENT OF FOOD ITEMS RECOVERED FROM THE STOMACH OF *Bufo Stomaticus* DURING MAY TO OCTOBER, 1985

		May	June	July	August	September	October
Total number of toads examined		27	51	46	30	21	16
Total number of prey eaten		689	1423	1263	467	368	152
Number of prey eaten per toad		26	28	27	16	18	10
Empty stomachs		3.70	9.80	0	13.33	0	25.0
Stomachs containing pebbles		3.70	25.49	19.57	16.66	19.05	12.50
Stomachs containing plant matter		37.0	29.41	34.78	26.66	33.33	31.25
Stomachs containing insects		96.29	90.19	100	86.66	100	75.0
Insect Order	Family/Name of the insect						
1. Thysanura	Machilidae (Bristle tail (arvae)	—	—	0.396	—	—	—
2. Diplura		—	0.070	—	—	—	—
3. Collembola (Spring tails)		0.145	0.70	—	—	—	—
4. Orthoptera	i) Tridactylidae (Pygmy mole- cricket)	—	0.141	—	0.428	0.815	—
	ii) Acrididae (Shorthorned grasshoppers)	0.145	0.070	0.158	0.214	—	—
	iii) Tettigonidae (Long horned grasshoppers and Katydids)	—	0.703	0.079	0.428	0.272	0.658
	iv) Gryllidae (Crickets)	—	—	0.428	0.079	0.815	1.316
5. Isoptera (Termites)		—	17.569	26.840	—	—	—
6. Dermaptera (Earwigs)		0.871	—	0.870	1.499	0.815	—
7. Mallophaga (Chewing lice)		—	0.070	0.079	—	—	—

Insect Order	Family/Name of the insect	May	June	July	August	September	October
8. Thysanoptera (Thrips)		0.145	—	—	—	—	—
9. Hemiptera							
a) Heteroptera							
	i) Corixidae (Water boatman)	—	—	—	0.214	—	—
	ii) Notonectidae (<i>Notonecta</i>)	—	—	—	0.428	1.085	—
	iii) Anthororidae (Flower bug)	1.306	—	—	—	—	—
	iv) Ploiariidae (Thread legged bug)	—	—	—	0.214	—	—
	v) Lygaeidae (Dusky cotton bugs)	0.871	0.141	—	0.857	0.658	—
	vi) Pyrrhocoridae (Red cotton bugs)	0.435	0.914	—	—	—	—
	vii) Cimicidae (Bed bugs)	0.145	—	—	—	—	—
	viii) Coreidae (Rice bugs)	0.145	—	0.238	0.214	0.543	—
	ix) Podopidae (Terrestrial turtle bugs)	—	—	—	0.214	—	—
	x) Pentatomidae (Stink bugs)	—	—	0.158	0.428	0.272	1.316
	xi) Others	0.290	—	—	—	—	—
b) Homoptera							
	i) Cicadidae (Cicadas)	—	—	0.079	—	—	—
	ii) Cicadellidae (Leafhoppers)	0.290	0.141	2.059	2.998	0.543	1.974
	iii) Fulgoridae (Plant hoppers)	—	0.211	0.633	1.285	2.446	2.632
	iv) Delphacidae (Plant hoppers)	—	—	—	—	0.815	—
	v) Psyllidae (Jumping Plant lice)	—	—	—	—	0.815	—
10. Coleoptera							
	i) Physodidae (Wrinkled bark beetles)	0.145	—	—	—	—	—
	ii) Cicindelidae (Tiger beetles)	0.290	—	0.238	—	—	—
	iii) Carobidae (Ground beetle)	0.290	0.281	2.375	—	—	—
	iv) Gyrinidae (Whirligig beetle)	—	0.141	—	0.214	—	—

Insect Order	Family/Name of the insect	May	June	July	August	September	October
	v) Dytiscidae (Predaceous diving beetle)	—	—	0.079	6.209	6.521	—
	vi) Telegeusidae (Telegeused beetles)	—	—	—	—	11.413	2.632
	vii) Histeridae (Hister beetles)	—	0.703	—	—	—	—
	viii) Scaphididae (Shining fungus beetles)	—	0.703	—	—	—	—
	ix) Pselaphidae (Short winged mold beetles)	—	—	0.475	0.642	5.706	1.316
	x) Cantharidae (Soldier beetles)	—	—	—	0.214	—	—
	xi) Dermestoidae (Carpet beetles)	0.145	0.422	0.554	3.426	0.543	1.974
	xii) Ostomidae (Bark growing beetles)	—	—	0.158	—	0.272	0.658
	xiii) Cleridae (Checkered beetle)	—	—	0.158	—	3.533	1.316
	xiv) Sandalidae (Sandalid beetles)	—	—	0.238	—	—	—
	xv) Elasteridae (Click beetles)	0.725	—	1.092	5.996	0.815	1.316
	xvi) Psephenidae (Water penny beetles)	—	1.124	1.188	—	2.174	—
	xvii) Lathridiidae (Monoedid beetles)	0.290	—	—	—	—	—
	xviii) Coccinellidae (Spotted beetles)	0.290	0.351	0.079	1.713	—	—
	xix) Tenebrionidae (Darkling beetles)	0.145	1.757	1.029	0.857	—	—
	xx) Psoidae (Twig beetles)	—	—	—	—	0.543	0.658
	xxi) Passalidae	0.290	—	—	—	—	—
	xxii) Scarabaeidae (Scarab beetles)	0.435	1.124	3.802	1.285	1.087	1.316
	xxiii) Cerambycidae (Wood boring beetles)	0.145	—	0.396	—	—	—
	xxiv) Chrysomelidae (Red pumpking beetles)	1.016	0.422	1.029	1.927	1.087	—
	xxv) Bruchidae (Seed beetles)	—	—	0.079	—	0.272	—

Insect Order	Family/Name of the insect	May	June	July	August	September	October
	xxvi) Circulionidae (Snout beetles)	0.290	0.351	0.950	1.070	1.902	3.947
	xxvii) Platypodidae (Pinhole borers)	0.290	0.070	—	0.214	—	—
	xxviii) Scolyidae (Bark beetles)	0.145	—	—	0.642	0.272	—
	Grubs	0.581	0.562	0.238	0.428	—	—
	xxix) Others	3.193	0.351	2.059	6.423	1.630	0.289
11. Lepidoptera	i) Gelechiidae (Pink wool worm moth), other moth	—	0.070	—	—	—	—
	ii) Noctuidae (Armyworm larvae, Heliiothis larvae)	1.306	—	0.475	0.428	0.543	1.316
	iii) Arctoidae (Hairy-caterpillar)	—	0.211	0.158	—	—	—
	iv) Pyraustidae (Cotton leaf roller)	0.281	0.079	—	—	—	—
	v) Pieridae (Cabbage caterpillar)	—	—	—	1.285	—	—
	vi) Other larvae	0.145	0.492	—	0.428	—	1.316
12. Diptera	(Flies)	0.435	0.070	—	0.428	0.272	1.316
	(Mosquitoes)	3.193	2.108	1.070	7.384	—	—
	(Maggots)	—	0.70	2.692	0.428	0.815	—
13. Hymenoptera	i) Braconidae	0.725	0.562	0.791	0.428	0.815	0.658
	ii) Trichogrammalidae	1.016	0.984	0.317	0.428	1.630	2.632
	iii) Sphecidae	1.457	8.451	1.504	—	1.087	1.316
	iv) Chalcididae	—	4.779	0.950	—	—	—
	v) Ichneumonidae	—	0.422	0.238	0.642	—	—
	vi) Formicidae	—	0.141	0.396	—	—	2.632
Subfam.	a) Formicinae	10.740	27.547	23.129	19.272	18.750	27.632
	b) Ants (Myrmicinae small ants)	66.183	32.959	22.169	30.835	21.739	30.263
	vii) Apidae (Bees)	0.435	0.141	0.317	0.428	2.717	—
	vii) Tanthridinidae (Althalia larvae)	—	—	—	0.214	—	—
14. Dictyoptera	(Cockroaches)	—	0.422	0.633	1.285	0.272	—
	Arachnida (Spiders)	0.871	0.632	0.238	0.428	1.630	3.289
	Chilopoda (Centipedes)	—	0.070	—	0.428	1.630	3.289
	Annelida (Earthworms)	—	0.070	—	—	—	—
	Mollusca (Gastropid molluscans)	—	0.492	0.238	0.428	—	—

In October 1985 (Table 1) the quantity of food in the stomach was comparatively lower than the earlier months and the predominant insects identified from the guts of *B. stomaticus* were again the Hymenoptera (ants). Other major food items were Fulgoridae (plant hopper mainly the *Pyrilla*), Telegeusidae (telegeusid beetles), Curculionidae (snout beetles mainly the grey weevil), Hymenoptera (parasites mainly the trichogrammatids) and Arachnids (spiders).

DISCUSSION

The present study has revealed that *Bufo stomaticus* fed on insects belonging to 70 families of 14 orders. The toad's capture of these insects was a chance factor. The representation of 28 families, of the order Coleoptera from

diverse habitats like agroecosystems, terrestrial, aquatic and arboreal also showed the affinity of this toad to such environments. Further, it also indicates *B. stomaticus* to be primarily insectivorous and no cannibalism was reported during the study period. However, Boulenger (1897) and Noble (1918) reported frogs & toads to be carnivorous and cannibalistic. The seasonal dietary requirements of the toad varied (Table 1). The insect consumption per toad was high (26-28) in the months of May-July but low (16) in August and lowest (10) in October. The high consumption of food in May-July was because of high reproductive activity of the toad, as evident from the field study, gonadal weight and gonado-somatic index (paper on breeding of *Bufo stomaticus* in preparation). The feeding rate declined in August and September; and in October, it was

TABLE 2
PERCENTAGE OF OCCURRENCE IN THE GUT

	May	June	July	August	September	October
Thysanura (Bristle tail larvae)			2.17			
Diplura		1.96				
Collembola (Spring tail)	3.70					
Orthoptera (Grasshoppers, Crickets)	3.70	3.92	6.52	6.67	4.76	6.25
		3.92	2.17	10.00	19.05	12.5
Isoptera (Termites)		11.76	28.26			
Dermaptera (Earwigs)	11.11		10.87	10.0	9.52	
Mallophaga (Chewing lice)		1.96	2.17			
Thysanoptera (Thrips)		1.96				
Heteroptera (Bugs)	29.62	17.64	10.87	23.33	28.57	18.75
Homoptera (Leaf/plant hoppers)	7.40	5.88	28.26	46.67	38.09	12.5
Coleoptera (Small grey weevil)	66.66	43.13	71.73	56.67	85.71	43.75
(Big grey weevil)	55.55	35.29	45.65	50.00	57.14	43.75
			10.87	3.33	9.52	18.75
Lepidoptera (Larvae)	22.22	15.68	10.87	10.0	9.52	12.50
(Moths)		3.92	2.17			12.5
Diptera (Flies)	11.11	1.96		6.67	4.76	12.5
(Mosquitoes)	18.51	23.52		13.33	19.05	
(Maggots)		1.96	4.34	6.67	9.52	
Hymenoptera (Parasites)	29.52	33.33	13.04	10.0	19.05	12.50
(Bees and wasps)	18.52	15.68	10.87	10.0	19.05	6.25
(Myrmicinae)	85.19	66.66	45.65	46.67	52.38	62.5
(Formicinae)	62.96	52.94	50.0	56.67	57.14	68.75
Dictyoptera (Cockroaches)		5.88	13.04	13.33	4.76	
Arachnida (Spiders)	14.81	13.72	4.34	6.67	23.81	25.0
Chilopoda (Centipedes)		1.96		3.33		
Annelida (Earthworms)		1.96				
Mollusca (Gastropod molluscans)		11.76	2.17			

very low because October marks the pre-hibernation period of the toad.

In the present study, hymenopterous ants of the sub-families Myrmicinae and Formicinae were dominant in the diet both in the percentage of prey eaten (Table 1) and the percentage of occurrence in guts (Table 2). Weber (1938) also reported the ants of family Formicidae to be the main food item in *B. marinus* and Forge and Barbault (1980) found ants and beetles to be the predominant food of *B. peytoni*.

The exact appreciation of the insect food can, however, be worked out in terms of per-

centage of total biomass (Tables 2, 4) consumed. Berry and Bullock (1962) and Berry (1965) measured the volume of the gut contents but have not presented it as per insect. The total biomass consumed per toad, calculated by the weighing coefficients gives the real bio-efficacy of anurans as control agents.

It may thus be inferred that the feeding potential can be appreciated on the basis of weight of insect rather than percentage total number of prey as the number is not representative of the size of insects belonging to different orders.

TABLE 3
PERCENTAGE OF TOTAL BIOMASS

Food items	May	June	July	August	September	October
Thysanura (Bristle tail larvae)	—	—	0.02	—	—	—
Diplura	—	0.04	—	—	—	—
Collembola (Spring tail)	0.001	—	—	—	—	—
Orthoptera (Grasshoppers, Crickets)	1.28	1.23	1.58	2.34	1.08	3.85
Isoptera (Termites)	—	15.94	18.45	—	—	—
Dermoptera (Earwigs)	4.13	—	3.09	2.92	1.73	—
Mallophaga (Chewing lice)	—	0.001	0.0008	—	—	—
Thysanoptera (Thrips)	—	0.001	—	—	—	—
Heteroptera (Bugs)	15.17	4.96	1.41	3.77	4.04	6.19
Homoptera (Leaf/plant hoppers)	0.01	0.012	0.09	0.06	0.06	0.12
Coleoptera (Small grey weevil)	12.30	12.31	16.29	19.32	29.67	14.07
(Big grey weevil)	39.57	21.88	31.76	52.64	44.56	40.96
	—	—	0.29	0.09	0.36	2.58
Lepidoptera						
(Larvae)	8.51	5.71	3.14	5.17	1.42	5.09
(Moths)	—	0.16	0.14	—	—	1.03
Diptera						
(Mosquitoes)	0.04	0.03	—	0.01	0.02	—
(Flies)	0.02	0.003	—	0.007	0.01	0.04
(Maggots)	—	0.02	0.056	0.05	0.10	—
Hymenoptera (Parasites)	0.28	0.66	0.28	0.03	0.12	0.41
(Bees and wasps)	2.30	2.66	1.51	1.68	5.02	1.38
(Myrmicinae)	3.93	1.94	0.99	0.75	0.58	1.19
(Formicinae)	11.73	29.79	18.95	8.66	9.15	19.91
Dictyoptera (Cockroaches)	—	0.99	1.14	1.26	0.29	—
Arachnida (Spiders)	0.70	0.51	0.14	0.14	0.59	1.75
Chilopoda (Centipede)	—	0.41	—	0.52	—	—
Annelida (Earthworm)	—	0.36	—	—	—	—
Mollusca (Gastropod molluscans)	—	0.16	0.06	—	—	—

Coleoptera (although occurring in much less number and frequency than ants and termites), in terms of biomass, was the predominant insect order (Tables 3 & 4). A similar observation was made by Berry and Bullock (1962) in *B. melanostictus*.

The maximum biomass (mg) consumed per toad of Coleoptera was during the pre-hibernation period in *B. stomaticus*. The chitinous material of Coleoptera consumed during this period probably served as a long lasting source of energy and hence were preferred. Furthermore, Coleoptera may be present in more abundance than the other insect orders in the habitat of this toad. The consumption of large numbers Coleoptera by *Rana tigerina* has been shown by Khan (1973) during the pre-breeding period.

Bufo stomaticus was also observed to feed substantially on mosquitoes and dystiscid beetles during the rainy season in July- August 1985 (Table 1), when the toads were seen breeding in water. Mosquitoes and dystiscid beetles are abundantly in the water of flooded paddy fields (Kadan and Patel 1960). As is clear from the present study, *B. stomaticus* fed both on terrestrial and aquatic fauna. However, Berry and Bullock (1962) found *B. melanostictus* feeding exclusively on terrestrial insects.

In the present study, bees and wasps were also recorded from the guts in tangible amounts. Noble (1924) showed that ants and wasps were rejected by frogs and toads whereas, Tyler (1958) and Khera (1975) recorded their occurrence as prey items. Tyler (1958) reported that the available insect prey was de-

TABLE 4
TOTAL BIOMASS CONSUMED (MG) PER TOAD

Thysanura (Bristle tail larvae)	—	—	0.11	—	—	—
Diplura	—	0.16	—	—	—	—
Collembola (Spring tail)	0.006	—	—	—	—	—
Orthoptera (Grasshoppers)	4.48	4.75	7.89	12.1	5.76	7.56
(Crickets)	—	0.89	0.49	3.03	6.48	2.84
Isoptera (Termites)	—	61.28	92.12	—	—	—
Dermaptera (Earwigs)	14.36	—	15.49	15.07	9.23	—
Mallophaga (Chewing lice)	—	0.004	0.004	—	—	—
Thysanoptera (Thrips)	—	0.004	—	—	—	—
Heteroptera (Bugs)	52.80	19.06	7.04	19.44	21.6	12.15
Homoptera (Leaf/plant hoppers)	0.04	0.05	0.46	0.32	0.32	0.24
Coleoptera (Small grey weevil)	42.82	47.33	81.73	99.73	158.67	27.63
(Big grey weevil)	137.07	84.12	158.54	271.70	238.33	80.44
	—	—	1.47	0.45	1.93	5.06
Lepidoptera (Larvae)	29.63	21.96	15.65	26.67	7.62	10.00
(Moths)	—	0.63	0.70	—	—	2.01
Diptera (Flies)	0.07	0.012	—	0.04	0.01	0.07
(Mosquitoes)	0.14	0.10	—	0.03	0.11	—
(Maggots)	—	0.08	2.81	0.25	0.54	—
Hymenoptera (Parasites)	0.96	2.55	1.39	0.13	0.62	0.81
(Bees and wasps)	8.04	10.21	7.55	8.68	26.87	2.71
(Myrmicinae)	13.68	7.45	4.93	3.89	3.09	2.33
(Formicinae)	40.84	114.53	94.58	44.70	48.96	39.11
Dictyoptera (Cockroaches)	—	3.84	5.67	6.52	1.55	—
Arachnida (Spiders)	2.44	1.94	0.72	0.73	3.14	3.44
Chilopoda (Centipede)	—	1.57	—	2.67	—	—
Annelida (Earthworm)	—	1.37	—	—	—	—
Mollusca (Gastropod molluscans)	—	0.62	0.29	—	—	—

pendent upon the type of vegetation in a particular habitat. According to Jensen and Klimstra (1966), Hedeon (1970) and Nigam (1979) anurans are opportunistic feeders and consume the most readily available food. The more frequent occurrence of toads in plant nurseries and orchards may be attributed to the easy availability of prey. Also, there seems to be a correlation between the abundance of toads and the ground fauna. However, Sweetman (1944) and Brower and Brower (1962) showed that anurans were capable of developing food preferences.

The seasonal variations in the diet of *B. stomaticus* in the present studies may be due to a change in the availability of fauna in a particular season and is in agreement with the observations of Tyler (1958), Brooks (1959, 1964), Turner (1959), Berry (1965), Khan (1973) and Khera (1975).

The present study reaffirms that toads are useful as control agents for various insect pests especially those belonging to the orders Coleoptera, Isoptera, Hymenoptera, Dermaptera and Diptera. Though toads appear to be opportunistic feeders, their feeding on many phytophagous insect pests does support their usefulness as biocontrol agents. A number of earlier workers like Gadow (1901), Pack (1922), Kadan and Patel (1960), Stiles *et al.* (1969) and Fellow (1969) also stressed the useful activity of toads.

The presence of stones, leaves and debris among the gut contents of *B. stomaticus* shows that the above material might have been engulfed

accidentally along with the prey (Table 1). Vegetable matter occurred in many guts, but the amount was quite small and may thus be well explained as inadvertently ingested with food. The intake of pebbles and plant matter may be important in providing roughage as well as increased girding capacity for the total mass envelope. The presence of stones and vegetable matter in the guts of anurans has also been reported by earlier workers. Tyler (1958), Berry and Bullock (1962), Berry (1965), Joshee (1968) and Kramek (1972).

Bufo stomaticus was observed to capture insects of all sizes ranging from 1 to 25 mm in length and weighing from 0.12 to 200 mg. Tyler (1958) mentioned that the essential factor to be observed when considering the diet of an anuran species is the recognition that there is a limit to the size of the food items that can be ingested, varying according to the size of the individual frog and the jaw span. The studies of Brooks (1959, 1964) and Kramek (1972) also showed that the food of *R. catesbeiana* and *R. septentrionalis* varied with the body size, sex, change of locality and season.

ACKNOWLEDGEMENTS

We are thankful to I.C.A.R. and Head, Department of Zoology, Punjab Agricultural University, Ludhiana for providing funds and facilities. We express our thanks to Dr. A.S. Sohi, Entomologist of Punjab Agricultural University, Ludhiana for identifying the insects.

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